

Dedicated Short Range Communications (DSRC)

ET Docket 98-95; WT Docket 01-90

Alliance of Automobile Manufacturers

Presentation to the FCC
December 16, 2004

Alliance Members

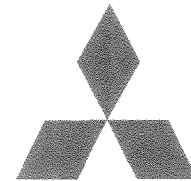
BMW Group

DAIMLERCHRYSLER



General Motors

MAZDA



**MITSUBISHI
MOTORS**

PORSCHE®

TOYOTA



Background

Alliance Members:

- Account for over 90% of vehicles sold in the US.
- Employ approximately 600,000 workers at more than 250 facilities in 35 states.

DSRC:

- Will enable first vehicle-to-vehicle interactive safety application.
- Fundamental building block for future active safety applications.

Alliance Member Safety Initiatives

Where we are today – 2004 model vehicles

- 99% available with ABS
- 85% available with safety belt load limiters
- 74% available with safety belt pretensioners
- 65% available with traction control
- 64% available with side air bags
- 46% available with electronic stability control

DSRC for Safety

Communications Between Vehicle and Infrastructure

- Blind Merge Warning
- **Curve Speed Warning**
- Emergency Vehicle Signal Preemption
- Highway/Rail Collision Warning
- Intersection Collision Warning
- In Vehicle Amber Alert
- In-Vehicle Signage
- Just-In-Time Repair Notification
- **Left Turn Assistant**
- Low Bridge Warning
- Low Parking Structure Warning
- Pedestrian Crossing Information at Intersection
- Road Condition Warning
- Safety Recall Notice
- SOS Services
- **Stop Sign Movement Assistance**
- Stop Sign Violation Warning
- **Traffic Signal Violation Warning**
- Work Zone Warning

Communications Between Vehicles

- Approaching Emergency Vehicle Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- **Cooperative Forward Collision Warning**
- Cooperative Vehicle-Highway Automation System
- **Emergency Electronic Brake Lights**
- Highway Merge Assistant
- **Lane Change Warning**
- Post-Crash Warning
- **Pre-Crash Sensing**
- Vehicle-Based Road Condition Warning
- Vehicle-to-Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong Way Driver Warning

Proceeding Background

ET Docket 98-95; WT Docket 01-90

- **5.850-5.925 GHz band allocated to DSRC in Dec. 1999**
 - DSRC cited as key element in improving safety of nation's highways (FCC 99-305, ¶ 19)
- **Service rules *Report & Order* adopted Dec. 2004** (FCC 03-324)
 - Noted that DSRC is key to achieving DOT's #1 priority of reducing highway fatalities that claim 43,000 deaths annually (¶ 2)
 - Recognized that timeliness and reliability are essential for crash avoidance applications; agreed that non-safety uses would be inappropriate if use resulted in a degradation of safety applications (¶ 15)
 - Nevertheless determined it "premature" to reserve service channels for specific applications; permitted safety/non-safety sharing throughout the band, with channel assignments for each communications request left to be determined by the priority levels of the Control Channel protocol. (¶ 29)
 - Recognized possible need to revisit the channel reservation issue in the future, given early stage of DSRC design (¶ 29)

Petitions for Reconsideration

- **ARINC and ITS America filed Petitions for Recon in Sept. 2004**
 - ARINC, supported by DOT contract, filed petition in its role as chair of the ASTM E17.51 DSRC Standards Writing Group
 - Both petitions requested that Channel 172 be designated for high-availability, low-latency vehicle-to-vehicle safety communications, necessary to ensure accident avoidance and mitigation safety goals
 - Supportive comments filed by the Alliance, Sirit Technologies, Raytheon, TransCore, and MarkIV IVHS.
 - ***No oppositions to requests were filed.***

Designated Channel Needed for Latency-Intolerant Safety Applications

- DSRC stakeholders agree on the need to designate one channel for highest priority, latency-intolerant vehicle safety applications, to ensure an interference-free environment for intensive and critical interactions in emergency situations.
 - DOT has already expressed concern about potential interference in the absence of frequency coordination (Oct. 22 *ex parte*)
- Key affected application is vehicle-to-vehicle communications that enable collision avoidance and mitigation (*e.g.*, extend bumpers, pretension seat belts, prep airbags).
 - No tolerance for delay – communications needed in the last 500 milliseconds before expected impact
 - Vehicle traveling at 70 MPH moves over 50 feet during this time period
- Setting aside Channel 172 for critical, latency-intolerant vehicle safety applications would better ensure the integrity of such applications than any control channel protocol approach.

Delay Likely in Congested Areas

- In dense traffic situations, DSRC activity – and related interference – will increase.
- DOT-funded Vehicle Safety Communications Project recently modeled channel loading situations to determine potential impact on emergency message reception probability.
 - Results of simulations not yet publicly released by DOT, but data showed significant interference under certain conditions in the simulation environment.
 - Provides preliminary support for position that high availability, low latency channel is needed.

Unacceptable Delay Scenario

- With no designated safety channel, collision avoidance and mitigation applications could fail due to delay in communications, as illustrated by the following scenario:
 - Vehicle A calculates a likely collision with vehicle B based on current speed and trajectory.
 - Vehicle A tunes to control channel; after waiting for opportunity to transmit amidst routine status messages from other nearby vehicles, Vehicle A broadcasts instructions that Vehicle B should tune to channel 172 for high priority message.
 - Vehicle A tunes to channel 172, finds multiple low priority transmissions (e.g. video downloads) in progress, including “hidden terminal” situation (*i.e.*, a transmitting location that cannot “hear” the priority emergency signal). Vehicle A must wait for its “turn” to transmit.
 - Vehicle A begins transmission, starting with notification of high priority status. At same instant, however, one or more “hidden terminals” begin low priority transmissions. Packets “collide;” no intelligible information received by any of the vehicles.
 - Vehicle A must try transmitting repeatedly until a naturally-occurring blank spot is found. Vehicles A & B need to exchange information regarding vehicle specifics and likely point of impact during approximately the last 500 milliseconds before impact. However, the latency introduced by one or more hidden transmitter situations may be more than several hundred milliseconds in a congested channel, leaving insufficient time to implement impact mitigation techniques.

Designation Needed Before Non-Safety Operations Become Entrenched

- R&O imposes no limit on the number of non-exclusive geographic roadside units (RSU) licenses granted. Each license permits use of all service channels. (§§ 57-58)
- It is contemplated that commercial and other services (provided via RSUs) will select a particular channel on which to operate, which could be Channel 172 in some locations. Thus, it will not be possible for control channel protocol to guarantee a uniform assignment of safety applications to an always-available channel.
- Without preserving Channel 172 for high availability and low latency communications, next generation critical safety applications could be precluded because all channels could become occupied by other services before these new safety applications are deployed.
 - Although these vehicle safety applications are several years off, it is not “premature” to designate the channel now, before incumbent non-safety operations become entrenched.

R&O Creates Uncertainty; Deters Introduction of Safety Applications

- Typical automotive design development cycles normally take 5-6 years, esp. for new electronic technology (*e.g.*, DSRC) to be incorporated into vehicle electrical systems across all model lines of a vehicle manufacturer (OEM).
- OEMs need to know *today* the status of spectrum availability several years in the future.
- Deferred consideration of the designation of a specific channel for low latency safety applications will create uncertainty among OEMs and potentially deter or delay the incorporation of DSRC devices in new vehicles.

Conclusion & Request

- The Commission should designate Channel 172 for high-availability, low latency safety communications without delay, to avoid future need to relocate non-safety operations that will populate the channel.
- In addition, the Commission should keep these dockets open until after the revised DSRC standard is submitted and the public has been allowed to review it and provide comment.